Informational Leaflet 125

A PRELIMINARY REPORT ON THE ALASKA SEA SCALLOP - FISHERY EXPLORATION, BIOLOGY, AND COMMERCIAL PROCESSING

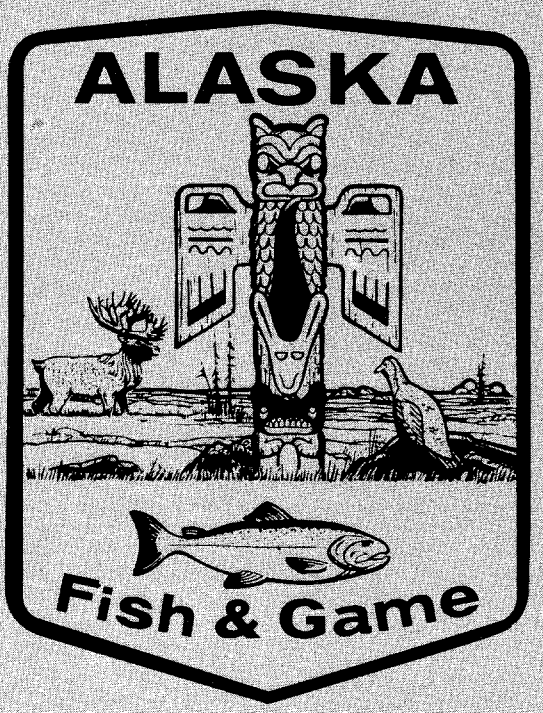
By:

Evan B. Haynes
U. S. Bureau of Commercial Fisheries
Biological Laboratory
Auke Bay, Alaska

and

Guy C. Powell
Alaska Department of Fish and Game
Division of Commercial Fisheries
Research Section
Kodiak, Alaska

July 8, 1968



STATE OF ALASKA
WALTER J. HICKEL - GOVERNOR

DEPARTMENT OF FISH AND GAME

SUBPORT BUILDING, JUNEAU 99801

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

We are grateful for the hospitality and assistance received from Miles Rice, captain of the F/V VIRGINIA SANTOS, and his crew members Ed Rains, Bob Low, Pat Brody, Warren Kinser, and Vivien Robinson. We are also indebted to captain Bruno Stals, a sea scallop fisherman from New Bedford, Massachusetts, for information on the east coast sea scallop fishery and to Howard Anderson, superintendent of King Crab, Inc., Kodiak, for use of his plant facilities during the study. The taste evaluation of the sea scallop meats was done under the supervision of Murray Hayes, director of the U. S. Bureau of Commercial Fisheries Technological Laboratory, Ketchikan, Alaska. Thanks are also due F. Heward Bell, director of investigations for the International Pacific Halibut Commission, Seattle, Washington, Lael Ronholt, assistant base director of the U. S. Bureau of Commercial Fisheries Exploratory Fishing and Gear Research Laboratory, Juneau, Alaska, and Charles Hitz, fishery biologist at the U. S. Bureau of Commercial Fisheries Exploratory Fishing and Gear Research Base, Seattle, Washington, for providing us with copies of cruise reports.

A PRELIMINARY REPORT ON THE ALASKA SEA SCALLOP - FISHERY EXPLORATION, BIOLOGY, AND COMMERCIAL PROCESSING

By

Evan B. Haynes, Fishery Biologist
U. S. Bureau of Commercial Fisheries
Biological Laboratory
Auke Bay, Alaska

and

Guy C. Powell, Fishery Biologist
Alaska Department of Fish and Game
Division of Commercial Fisheries
Research Section
Kodiak, Alaska

INTRODUCTION

Between 1953 and 1966, surveys for sea scallops, Patinopecten caurinus, were conducted intermittently in waters off Alaska by both the U. S. Bureau of Commercial Fisheries and private individuals. Some of these surveys showed that in certain areas the size and abundance of scallops compared favorably with the fishery in the North Atlantic. The declining catches of the king crab (Paralithodes camtschatica) in 1967 prompted fishermen to renew their efforts to find sea scallops of commercial size and quantity. These efforts were successful and resulted in the establishment of a small commercial fishery off Kodiak, Alaska, in December, 1967.

Successful management of the sea scallop fishery off Kodiak will depend, in part, on adequate knowledge of the biology of the sea scallop. To help acquire such knowledge we accompanied Miles Rice, captain of the F/V VIRGINIA SANTOS, on a fishing trip for sea scallops to the northern edge of Long Island Bank, an area about 30 miles northeast of Kodiak, Alaska, on January 6-9, 1968. The information collected during the trip is summarized in the present report.

Also included in the present report is a review of the explorations

for sea scallops in the Gulf of Alaska, information on incidental catches of king crab in the scallop dredge, comparison of commercially prepared packs of east coast and Kodiak scallops, and a short discussion of the future of the Alaskan sea scallop fishery.

MATERIALS AND METHODS

Scallops were collected with a standard New Bedford type sea scallop dredge. Dredge width was 11 feet, ring size 3 inches (inner diameter), wire diameter of rings and links 7/16 inches, and each ring was double linked. A detailed description of this type of gear has been given by Posgay (1957). The dredge was towed about 45 minutes, retrieved, and the catch emptied on deck.

Each catch of scallops was measured using bushel wire baskets and the number of bushels of scallop per tow recorded.

Shell size (height) of scallops was determined by measuring, to the nearest millimeter, the straight line distance from umbo to outer shell margin.

The catch was not shucked at sea as is the custom with Atlantic coast fishermen but put in live tanks filled with circulating sea water and delivered alive to the processor at a shore plant in Kodiak.

Ashore, the height-weight relation, percent recovery of shucked meats, and loss of meat weight from shucking were determined from live scallops. In the text, the term "meat" refers only to the adductor muscles, sometimes called the "eye" or "button". Meats were blotted of excess liquid before being weighed to ± 0.1 ounce. Total weight of whole scallops included any foreign matter on the shell surfaces.

Shells of sea scallops were used for age and growth studies. The method used for aging the shells is described briefly by Bourne (1964).

The gonads of several hundred sea scallops were examined to determine the stage of sexual development. The developmental stage was estimated by gonad color and verified by microscopic examination of gonadal tissue.

Geographic locations mentioned in the present report are shown in Figure 1.

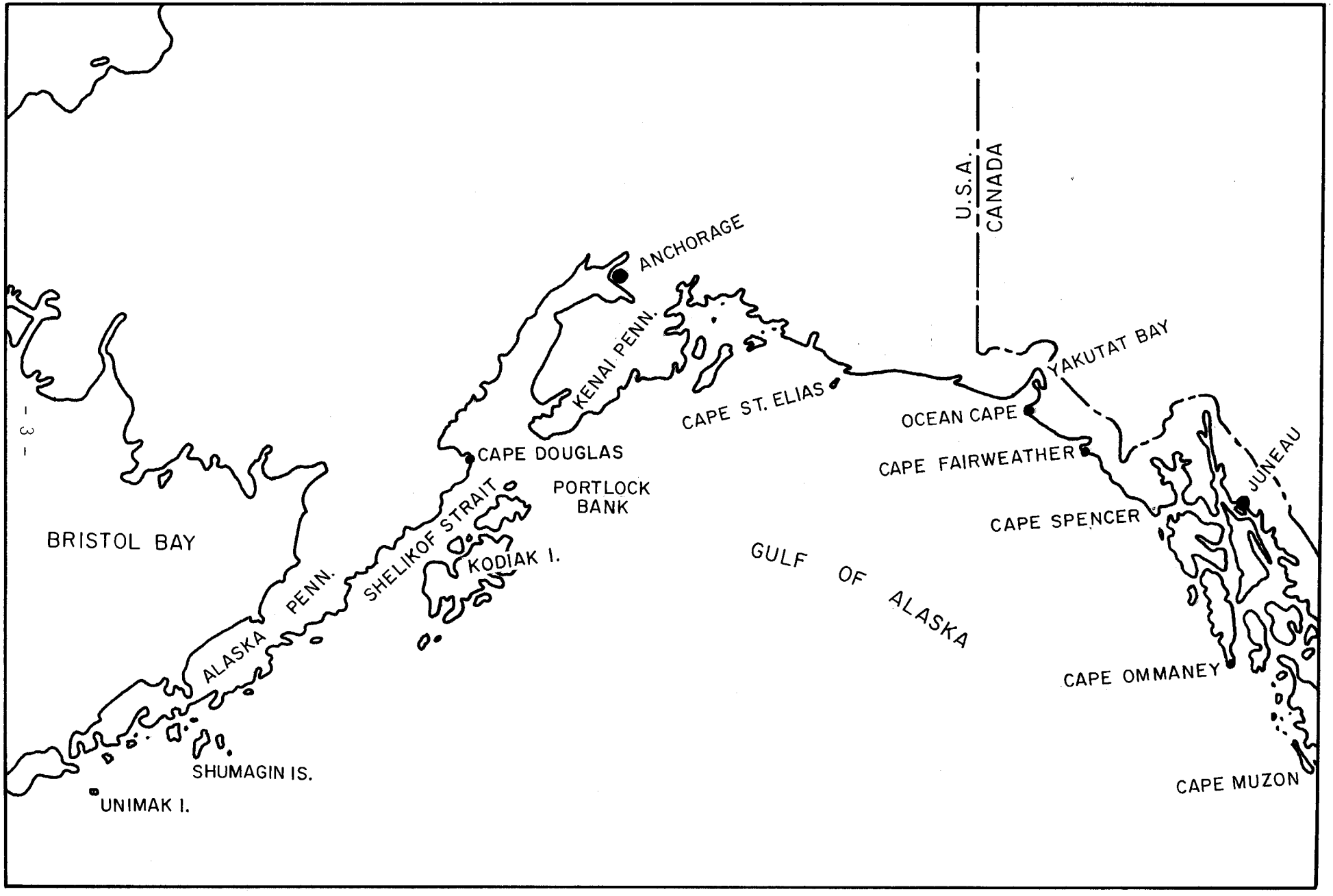


Figure 1. Geographical locations mentioned in the present report.

REVIEW OF EXPLORATORY FISHING EFFORTS FOR SEA SCALLOPS IN WATERS OFF ALASKA

Commercial quantities of sea scallops have been sought in the Gulf of Alaska since 1953. In March of that year, the U. S. Bureau of Commercial Fisheries vessel JOHN N. COBB explored for sea scallops in the Yakutat Bay area of Southeastern Alaska. During this survey, 392 sea scallops were caught. In August, 1953, the late Lee Wakefield, a well-known sea foods processor, financed a survey by Captain Stan Lee, using the 50 foot F/V AFOGNAK. A New Bedford type sea scallop dredge was used to fish the inland waters around Kodiak Island intermittently from August 1953 to August 1954. Although catch data from this survey are not available, interviews with Captain Lee and one of his crew members in February 1968, revealed that about 1,000 sea scallops of marketable size were caught. Most of the scallops were caught south of Cape Douglas in the Hallo Bay area of Shelikof Strait.

From 1954 to 1963, there were 4 trawl surveys for bottom fish and 1 trawl survey for king crab and shrimp in the Gulf of Alaska. During these surveys more than 10,000 sea scallops were caught incidentally in 1,891 tows. Most of the scallops were taken between Cape St. Elias and Cape Spencer.

In 1963 and 1964, the U. S. Bureau of Commercial Fisheries resumed explorations for sea scallops in the Gulf of Alaska using New Bedford type scallop dredges. During these explorations, 157 tows were made from Unimak Island to Cape Spencer. Results of the explorations between Cape St. Elias and Cape Spencer were encouraging. Catches were as high as 7 bushels of scallops per drag.

Summaries of the explorations for sea scallops from 1953 to 1964 and of the locations and sizes of the best catches are given in Tables 1 and 2, respectively.

From 1965 to August, 1967, there were explorations in waters off Kodiak Island for sea scallops by the king crab fishing vessels VITA, HEKLA, and TRADEWIND using sea scallop dredges borrowed from the U. S. Bureau of Commercial Fisheries. These explorations did not locate commercial quantities of sea scallops.

Prompted by the continuing decline in catches of the king crab (Paralithodes camtschatica), two king crab fishing vessels were converted for dredging in 1967 -- the 174 foot F/V VIRGINIA SANTOS, captained by Miles Rice, and

Table 1. Summary of Catches of Sea Scallops in the Gulf of Alaska, 1953-1964.

Vessel or agency	Date Month	Year	Number of stations	Catch of sea scallops	Greatest catch of sea scallops/tow	Fishing area	Gear
Paragon	June - Sept.	1964	67	13 bushels	4 bushels	Chiniak and Marmot Bays, Shumagin Islands and south side of Unimak Is.	New Bedford type scallop dredge.
Yaquina	July - August	1963	8	1 bushel	1 bushel	Off Seal Rocks and Kukak Bay in Shelikof Strait	New Bedford type scallop dredge
Manning	May - June	1963	82	103 bushels	7 bushels	Cape St. Elias to Cape Fairweather	New Bedford type scallop dredge
Yaquina	July - Nov.	1962	215	509 scallops	360 scallops	Chatham Strait to Portlock Bank	400 mesh otter trawl, 40 and 70 foot shrimp trawls, and 40 foot flat trawl
Int. Pacific Halibut Commission	May - April	1961 - 1963	1,272	7,316 scallops	1,500 scallops	Unimak Pass to Cape Spencer	Otter trawls
Tordenskjold	June - Sept.	1961	232	2,356 scallops	1,000 scallops	Cape Spencer to Cape Douglas	Otter trawls
New Hope	Sept. - Oct.	1960	37	501 scallops	300 scallops	Cape Muzon to Cape Ommaney; off Cape Fairweather	Otter trawls

Table 1. Summary of Catches of Sea Scallops in the Gulf of Alaska, 1953 - 1964 (continued)

Vessel or agency	Date Month	Year	Number of stations	Catch of sea scallops	Greatest catch of sea scallops/tow	Fishing area	Gear
John N. Cobb	Sept. - May	1961 - 1962	135	76 scallops	24 scallops	Cape St. Elias to Blying Sound; Seward Gully and Albatross Gully	Otter trawls
Afognak	Aug. - Aug.	1953 - 1954	unknown	1,000 scallops	unknown	Kodiak Island-Shelikof Strait	New Bedford type scallop dredge
John N. Cobb	March-April	1953	79	392 scallops	49 scallops	Yakutat Bay and off Ocean Cape	New Bedford type scallop dredge, small otter trawl, 20 foot beam trawl, shrimp traps and crab traps
TOTALS			2,127	117 bushels plus 12,150 scallops			

Table 2. Summary of the locations and quantity of sea scallops in best catches during exploratory cruises in the Gulf of Alaska, 1953 - 1964.

Location				Quantity of		Maximum depth		
Lat.	N.	Long.	W.	scallops	Date	(fathoms)	Gear	Vessel
58°	48'	138°	05'	200 scallops	9/20/60	35	Trawl	New Hope
58°	51'	138°	06'	300 scallops	9/20/60	44	Trawl	New Hope
58°	49'	138°	08'	600 scallops	10/2/62	41	Trawl	Arthur H
58°	50'	138°	09'	1,500 scallops	6/24/62	39	Trawl	Arthur H
59°	19'	139°	25'	231 scallops	7/15/61	60	Trawl	Tordenskjold
59°	26'	139°	50'	350 scallops	10/17/62	68	Trawl	Arthur H
59°	40'	141°	30'	204 scallops	7/28/61	50	Trawl	Tordenskjold
59°	49'	141°	45'	6 bushels	6/8/63	42	Dredge	Manning
59°	46'	141°	50'	855 scallops	7/13/62	43	Trawl	Arthur H
59°	48'	141°	52'	190 scallops	1/27/63	52	Trawl	Western Flyer
59°	50'	141°	55'	4 bushels	6/8/63	41	Dredge	Manning
60°	00'	142°	59'	6 bushels	6/9/63	62	Dredge	Manning
60°	01'	142°	59'	300 scallops	9/6/61	74	Trawl	Tordenskjold
60°	00'	143°	06'	5 bushels	6/9/63	57	Dredge	Manning
59°	53'	144°	01'	166 scallops	9/1/61	51	Trawl	Tordenskjold
59°	45'	144°	04'	1,075 scallops	7/21/62	56	Trawl	Arthur H

Table 2. Summary of the locations and quantity of sea scallops in best catches during exploratory cruises in the Gulf of Alaska, 1953 - 1964 (continued).

Location				Quantity of		Maximum depth		
Lat.	N.	Long.	W.	scallops	Date	(fathoms)	Gear	Vessel
59°	48'	144°	04'	5 bushels	6/10/63	55	Dredge	Manning
59°	45'	144°	16'	1,000 scallops	9/3/61	62	Trawl	Tordenskjold
59°	46'	144°	16'	360 scallops	10/2/62	62	Trawl	Yaquina
59°	44'	144°	17'	374 scallops	7/21/62	64	Trawl	Arthur H
59°	45'	144°	17'	280 scallops	1/30/63	61	Trawl	Western Flyer
59°	41'	144°	33'	188 scallops	7/23/62	77	Trawl	Arthur H
59°	37'	145°	20'	160 scallops	9/17/62	65	Trawl	Western Flyer
59°	39'	145°	30'	400 scallops	7/28/62	68	Trawl	Arthur H
57°	24'	150°	58'	225 scallops	7/26/61	54	Trawl	Arthur H
57°	54'	151°	30'	161 scallops	7/27/61	46	Trawl	St. Michael
58°	04'	151°	58'	4 bushels	6/24/64	69	Dredge	Paragon

the 58 foot F/V CLOVERLEAF captained by Sam Franklin, both of Kodiak. Both vessels were successful in finding commercial quantities of sea scallops in the Kodiak Island area. The first commercial delivery of sea scallops was made August 3, 1967, when the F/V CLOVERLEAF delivered 206 pounds of live unshucked scallops at Kodiak. By the end of 1967, 7,588 pounds of live unshucked scallops had been delivered to processors at Kodiak.

On January 9, 1968, the F/V VIRGINIA SANTOS, with the aid of Bruno Stals, an east coast scallop fisherman, caught 30,000 pounds of sea scallops in about 30 hours fishing. Bruno Stals was hired by the State of Alaska to provide technical assistance to Kodiak fishermen exploring for sea scallops. During the 30 hours of fishing, the catch per 45 minute tow for 26 consecutive tows ranged from 13 to 30 bushels of sea scallops and averaged 22 bushels per tow. Catches of this magnitude are encouraging when compared to average catches of about 7 bushels of sea scallops per tow for good fishing in the North Atlantic. By the end of January, 1968, three boats made deliveries at Kodiak of unshucked scallops totaling 107,352 pounds.

In February, some fishermen began shucking the scallops at sea--the usual practice of east coast sea scallop fishermen. The February landings of 32,803 pounds of sea scallops consisted of both unshucked sea scallops (16,625 pounds) and shucked meats (16,178 pounds). Shucked weight of Alaskan sea scallop meats is 11.5 percent of the weight of the whole scallop (Table 3). The weight of shucked sea scallop meats produced by the Alaskan fishery through February, 1968, was 30,435 pounds.

NOTES ON BIOLOGY OF SEA SCALLOPS

Data on size, sexual maturity, and shell height-meat weight relation were collected January 6-9, 1968 on Long Island Bank. In our analyses of size distribution, we have combined the data from all tows because of the apparent similarities among the catches.

Size Distribution

The range in size of scallops was wide--from about 2 inches to more than 8 inches--but about 90 percent of the scallops exceeded 5 inches (Figure 2).

The reason for the scarcity of scallops between 3 and 4-1/2 inches is not known. Because the inner diameter of the dredge rings was 3 inches, one

Table 3. Average weight of whole sea scallops and of shucked meats by shell heights for 48 scallops from Long Island Bank, January 6-9, 1968.

Shell height	Number of scallops	Average weight of whole scallops (pounds)	(ounces)	Average weight of shucked meats (pounds)	(ounces)	Percent recovery of meat
3.5 - 3.9	1	---	3.5	---	0.35	10.0
4.0 - 4.4	-	---	---	---	----	----
4.5 - 4.9	1	---	5.0	---	0.60	12.0
5.0 - 5.4	4	---	8.5	---	0.98	11.5
5.5 - 5.9	5	---	12.5	---	1.41	11.3
6.0 - 6.4	12	---	15.0	---	1.80	12.0
6.5 - 6.9	11	1	2.6	---	2.18	11.7
7.0 - 7.4	13	1	4.3	---	2.26	11.1
7.5 - 7.9	-	---	---	---	----	----
8.0 - 8.4	1	1	12.2	---	2.80	9.9
Total	48				Average	11.5

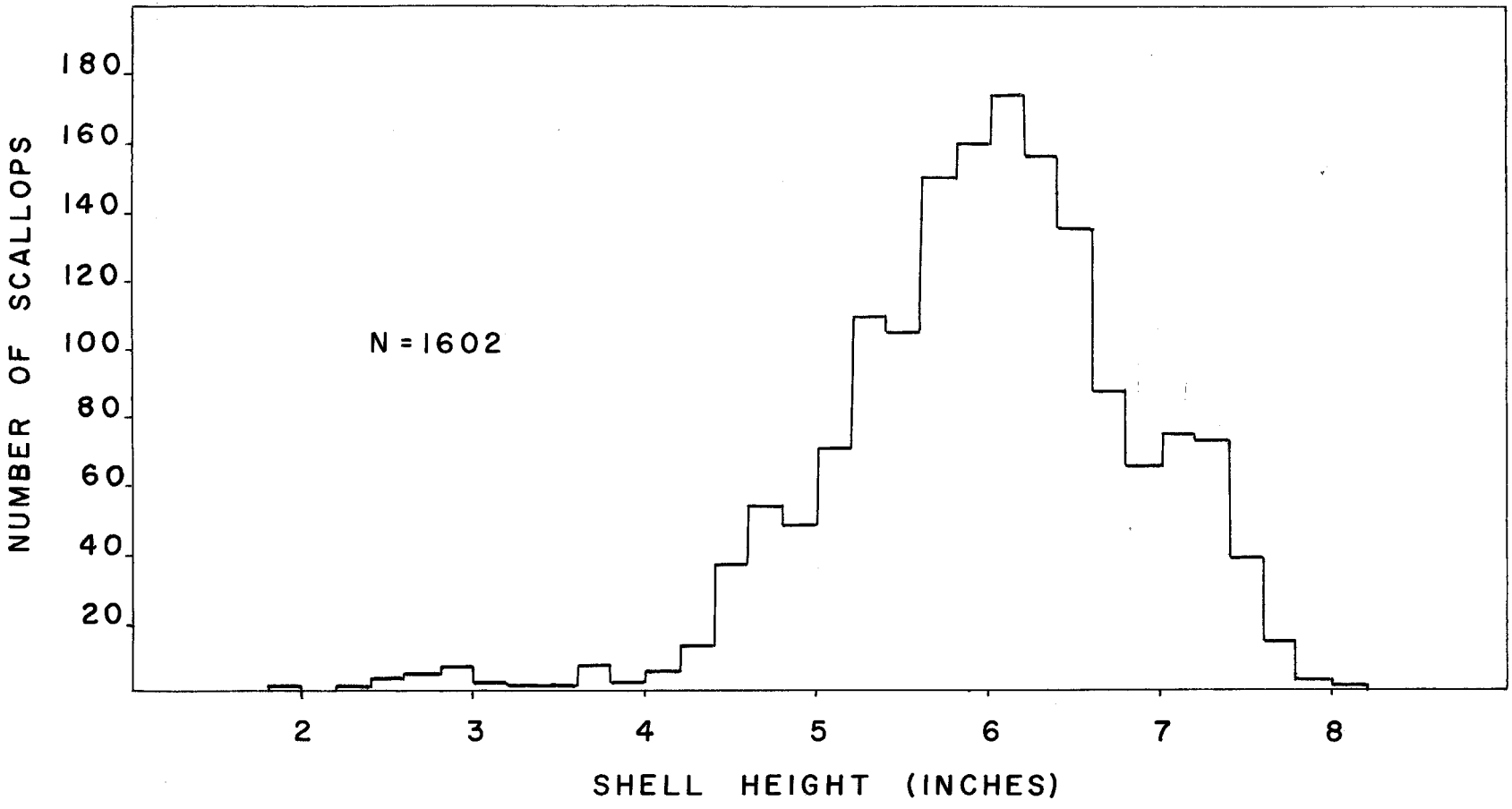


Figure 2. Size distribution of sea scallops from Long Island Bank, about 30 miles northeast of the town of Kodiak, Alaska, January 6-9, 1968.

would expect retention of all scallops greater than this diameter. Yet less than 3 percent of the sampled catch was between 3 and 4-1/2 inches. If the low catch of scallops in this size range indicates a real scarcity, a future fishery which would be dependent on these scallops as adults would have few scallops to catch. The near lack of small scallops in the catches may have resulted, however, from factors other than low abundance. For instance, sampling of east coast sea scallops indicated that small scallops have a more patchy distribution than large scallops (Bourne, 1964). Also, television cameras mounted on scallop dredges have shown small scallops swimming out of the path of an approaching dredge (senior author's personal observation).

Relation Between Weight of Scallop and Shucked Meat

The fishing practice of bringing whole scallops to port differs radically from the east coast sea scallop fishery where the scallops are shucked at sea and only the meat is retained. If fishermen continue to bring whole, live scallops to port, the relation of the weight of the shucked meat to total weight will be of importance to both processor and fisherman. This relation was determined for 48 scallops (Table 3). As shown in Table 3, the percentage of meat recovered from scallops of different sizes (i.e. weight) was similar. Meat recovery ranged from 9.9 percent (1 scallop) to 12.0 percent and averaged 11.5 percent. It appears, therefore, that percentage of shucked meat recovered from sea scallops will be approximately 10 percent of the total weight of the scallop regardless of scallop size (height).

During shucking some of the meat remains on the shell. The amount of meat remaining on the shell after shucking is related to shell height. The total weight of meat was found for individual scallops by carefully scraping residual meat from the shell after shucking and adding the weight of the residual meat to that of the shucked meat. As shell height increases, the weight of meat lost from shucking also increases (Table 4, column 5). Percentage meat loss, however, decreases because, although more meat is lost when shucking a large scallop, the loss is not as great when compared to the total weight of the meat (Table 4, column 6).

Relation of Meat Yield to Height and Age

The relation of meat yield to size and age of scallops was plotted for 98 scallops (Figure 3). Meat yield is expressed in two ways: the weight of individual shucked meats and as the number of shucked meats required to make

Table 4. Average meat loss and percentage meat loss of 49 scallops caught off Kodiak Island, Alaska, in January, 1968.

Shell height (inches)	Number of scallops	Total meat weight (ounces)	Weight of meat lost during shucking		Percentage meat loss
			Total (ounces)	Average (ounces)	
3.0 - 3.4	1	0.25	0.06	0.06	24.0
3.5 - 3.9	3	1.09	0.20	0.07	18.3
4.0 - 4.4	4	2.11	0.38	0.09	18.0
4.5 - 4.9	12	8.65	1.26	0.10	14.6
5.0 - 5.4	13	12.48	1.41	0.11	11.3
5.5 - 5.9	8	11.74	0.90	0.11	7.7
6.0 - 6.4	6	10.05	0.70	0.12	7.0
6.5 - 6.9	2	4.00	0.40	0.20	10.0
				Average	
TOTAL	49	50.37	5.31	0.11	10.5

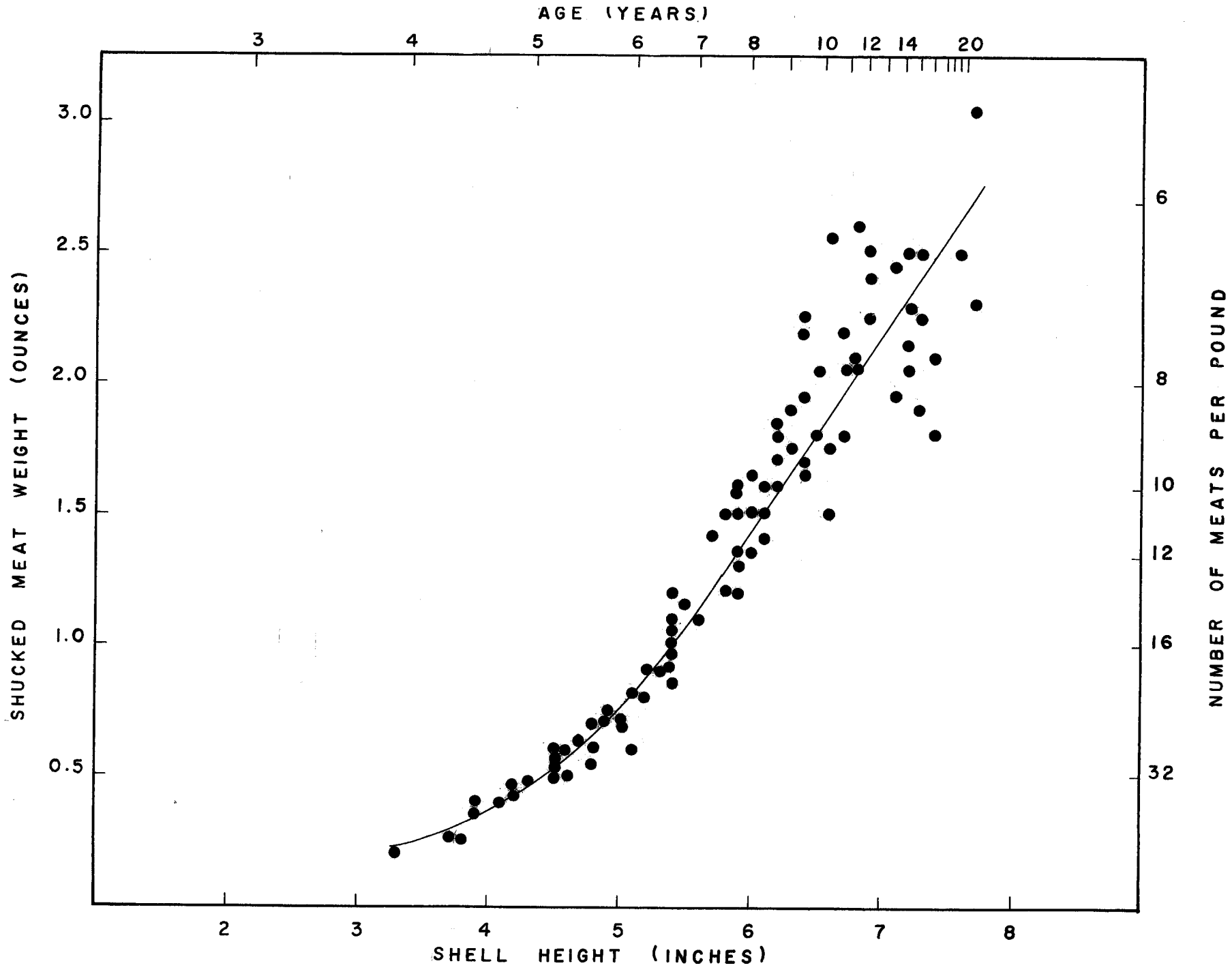


Figure 3. Relation of meat yield to height and age of sea scallops.

one pound. The size is expressed as height of shell in inches and age of scallops as years.

The graph shows that the meat yield from scallops is lowest when the scallops are small but increases rapidly as shell height increases. Some scallops have meats that weigh more than 3 ounces.

A comparison of meat yields at different shell heights deserves close consideration. Forty-six shucked meats are required to yield one pound from scallops 4 inches in height whereas the meats from 46 scallops 6 inches in height (the size of scallops most common in the catches) would weigh 4.1 pounds--a 4-fold increase in meat weight (Table 5). We do not know, however, the mortality of the scallops during this period.

Table 5. Average yield of shucked meat per scallop and number of meats per pound for scallops 4-8 inches shell height.

Height (inches)	Average meat yield (ounces)	Number of meats per pound
4	0.35	46
5	0.75	21
6	1.42	11
7	2.17	7
8	2.94	5

Yield of shucked meat increases with age but the rate that it increases declines as the scallops get older (Figure 3). The following values from the graph emphasize this for 4 to 18 year old scallops (Table 6). Within the age groups considered, the greatest increase in meat weight (0.37 ounces) occurs between the 6th and 7th years, that is, when the animals are growing from 5.1 to 5.7 inches (see Figure 3). Thereafter the annual increase in meat weight is less for each succeeding year of growth.

Table 6. Annual increase in shucked meat weight for scallops 4 to 18 years of age.

Age	Meat yield (ounces)	Age interval (years)	Annual increase (ounces)
4	0.25	---	
		4 - 5	0.23
5	0.48	---	
		5 - 6	0.35
6	0.83	---	
		6 - 7	0.37
7	1.20	---	
		7 - 8	0.24
8	1.44	---	
		8 - 9	0.21
9	1.65	---	
		9 - 10	0.19
10	1.84	---	
		10 - 11	0.15
11	1.99	---	
		11 - 12	0.11
12	2.10	---	
		12 - 13	0.10
13	2.20	---	
		13 - 14	0.10
14	2.30	---	
		14 - 15	0.09
15	2.39	---	
		15 - 16	0.09
16	2.48	---	
		16 - 17	0.06
17	2.54	---	
		17 - 18	0.04
18	2.58	---	

Sexual Development

Microscopic examination of the gonads of the sea scallop showed that the sexes are separate.

Sexes of mature individuals could be distinguished by gonad color--"ripe" male and female gonads were whitish and pinkish, respectively. Gonads of "unripe" (immature) scallops were transparent and watery. Using these criteria, most scallops smaller than about 3 inches were immature and most larger individuals were mature.

It is not known when the Alaskan sea scallop spawns. The presence of "ripe" gonads in scallops caught in January suggest that spawning occurred no more recently than November or December. The east coast sea scallop spawns in late September and October. Only by sampling throughout the year will the maturation and spawning period of Alaskan sea scallops be determined precisely.

INCIDENTAL CATCHES OF KING CRAB WHILE DREDGING FOR SEA SCALLOPS

King crab of both sexes were captured incidentally in the scallop dredge during the January, 1968, survey by the F/V VIRGINIA SANTOS. King crab seldom occurred in the same catches as sea scallops. Deaths or permanent injuries of king crab were greatest in those hauls containing rocks. The most king crab in any one haul was 33. Twenty-six (79%) of these crab were dead or so seriously injured that it was unlikely they would survive when returned to the water. King crab were not caught in areas where the catch of scallops was high. We do not know if king crab inhabit areas of high sea scallop abundance during other months of the year. Nor do we know if a fishery for sea scallops will significantly deplete the king crab resource.

COMPARISON OF COMMERCIALLY PREPARED PACKS OF KODIAK AND EAST COAST SEA SCALLOPS AND RECOMMENDATIONS FOR A BETTER PRODUCT

Five pounds of raw, chilled Kodiak sea scallop meats were compared with a 5 pound frozen commercial pack of east coast sea scallop in regard to uniformity of size, color, taste, and cleanliness by personnel of the U. S.

Bureau of Commercial Fisheries Technological Laboratory at Ketchikan. The meats in the east coast pack were more uniform in size than those of the Kodiak pack. The ten largest meats in the Kodiak pack averaged 54.3 grams and the ten smallest 14.5 grams. The ratio of these two weights (3.74) was used as a measure of the uniformity of size. The ratio is considered high. Specifications for commercially packaged east coast sea scallop meats limit the ratio to about 2.0.

Many of the sea scallops in the Kodiak pack were darker in color than those of the east coast pack. The presence of dark meats in the Kodiak pack was undoubtedly the result of including meats from old (very large) scallops. Meats from old scallops are usually darker and more "stringy" than those from young scallops; there is no evidence, however, that their nutritive qualities are less than those of meats from young scallops. A pack of more uniform color could be obtained from Kodiak by sorting. Sorting is not critical in packaging meats from east coast sea scallops because old, large sea scallops are rarely caught.

Several people at the Technological Laboratory tasted meats of both the east coast and the Kodiak scallops. All preferred the Kodiak scallops. These results are not conclusive, however, because the east coast scallop meats were frozen and the ones from Kodiak were not. Personal experience of the senior author is that freshly caught sea scallops from both coasts are very similar in flavor; also, the meats from smaller sea scallops (those less than about 5 inches) are usually "sweeter" than larger scallops.

The preparation of the Kodiak pack was not as good as the east coast pack. The Kodiak pack contained 36 pieces and thin sections of sea scallop meats and also sediment and pieces of shell; this probably indicates both inexperienced shuckers and a lack of sufficient washing of the meats. On the east coast the fishermen wash the scallop meats at sea thus eliminating much of the sediment and shell and many of the small pieces of meat before they reach the processor. In addition, the Kodiak pack contained small portions of the adductor muscle. This portion of the adductor muscle is not as tender as the rest of the muscle.

Most of the disadvantages in the Kodiak pack are probably easily corrected by experience. Considering the criticisms of the Kodiak pack, the Technological Laboratory recommended: (1) careful grading of the meats for size and color, (2) removal of extreme sizes of meat for use in a special purpose pack, (3) more careful washing, (4) removal of the small portion of the adductor muscle, and (5) maintaining the usual sea food plant sanitation.

FUTURE OF THE ALASKAN SEA SCALLOP FISHERY

Both the State of Alaska and the U. S. Bureau of Commercial Fisheries realized that to assure success of an Alaskan sea scallop fishery, the discovery of scallop beds of commercial size was imperative and that it was impractical to expect fishermen or processors to pay the cost of the required extensive survey of the Gulf of Alaska. The two agencies entered into agreement, therefore, to provide funds for an economic feasibility study of the scallop resources in the Gulf of Alaska.

The study of the sea scallop resources in the Gulf of Alaska would be carried out using a commercial sea scallop fishing vessel from New Bedford, Massachusetts. The vessel selected was the 90 foot F/V VIKING QUEEN captained by Kaare Ness of New Bedford. Areas to be surveyed are from Lituya Bay to Cape Cleare, Cook Inlet, and off Kodiak Island. During the survey, information will be collected on the geographical distribution of sea scallops, catch per tow, scallop size, age and growth, shell height-meat weight relation, and the cost of catching, processing, and selling the catch.

The survey began April 27, 1968, and at press time was still in progress. During the first 9 fishing days the area from Lituya Bay to Ocean Cape was sampled. Results were very encouraging. In some areas, there were catches as high as 100 bushels of sea scallops per tow (total for two dredges fished simultaneously).

Because the abundance of sea scallops is at an all time low on Georges Bank, the major fishing ground of the U. S. and Canada sea scallop fleets, there should be an excellent market for the sea scallop meats produced in Alaskan waters. In Ireland, England, France, and Australia, the gonads (egg sacs) of scallops are marketed along with the adductor muscles. In some areas even the mantles are marketed (Bourne, 1964). It is not known if the viscera and gonads of sea scallops caught in waters off Alaska can be marketed. Preliminary tests of the viscera as bait for king crab have proven unsuccessful. Samples of viscera have been shipped to the State of Washington for experimental use as bait for dungeness crab. Also, certain brokers are studying the feasibility of marketing the gonads.

BIBLIOGRAPHY

The following reports were selected as especially useful for fishermen and processors. The first report (by Bourne) may be obtained by writing to the Queen's Printer, Daly Building, Ottawa, Canada. Price $1.75. The remaining three reports may be obtained by writing to either the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, or the U. S. Department of Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D. C. 20240.

Bourne, N. 1964. Scallops and the offshore fishery of the Maritimes. Fish. Res. Bd. Canada. Bull. No. 145:60 p.

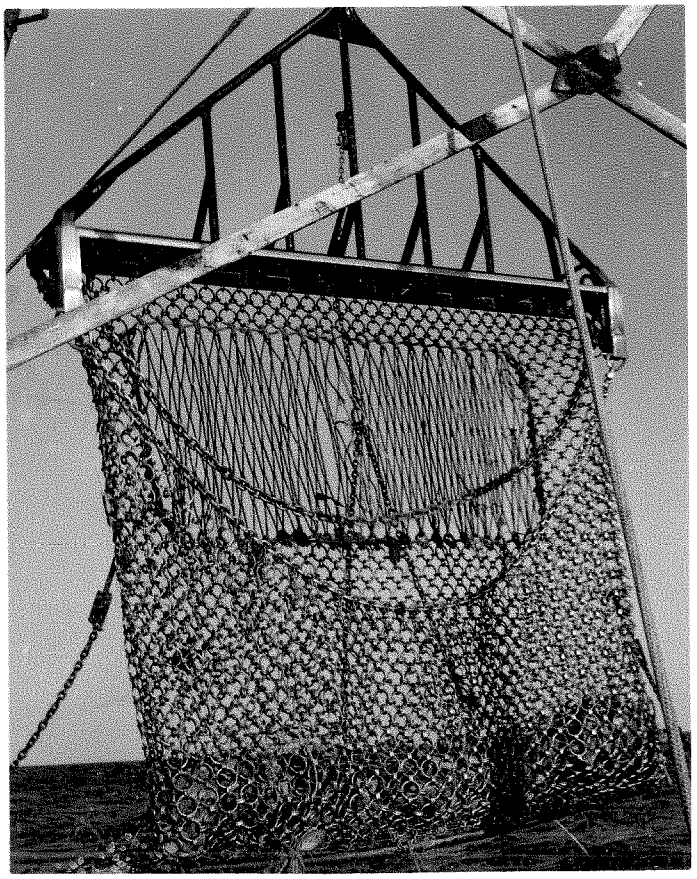
Posgay, J. A. 1957. Sea scallop boats and gear. U. S. Fish and Wildl. Serv., Fish. Leafl. 442:11 p.

Rathjen, Warren F., and Joaquim B. Rivers. 1964. Gulf of Alaska scallop explorations--1963. Comm. Fish. Rev. 26(3): 1-7.

Schaefers, Edward A., and Keith A. Smith. 1954. Shellfish explorations in the Yakutat Bay area, Alaska, by the John N. Cobb, spring 1953. Comm. Fish. Rev. 16(3): 1-12.

Pictured from left to right: Miles Rice, captain of the F/V VIRGINIA SANTOS; Evan Haynes, Fishery Biologist, U. S. Bureau of Commercial Fisheries; Bruno Stals, sea scallop fisherman from New Bedford, Massachusetts; and Guy Powell, Fishery Biologist, Alaska Department of Fish and Game.

A typical catch of sea scallops collected about 30 miles northeast of the town of Kodiak, Alaska.



A standard New Bedford type sea scallop dredge coming aboard the F/V VIRGINIA SANTOS.